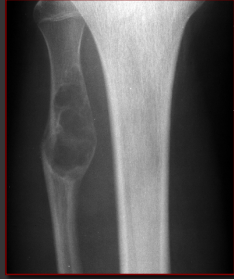


## Decision Support for Bone Tumor Diagnosis



Expansile, lytic lesion in fibula  
Biopsy: Aneurysmal bone cyst



This seems "aneurysmal" and  
located in fibula, therefore ABC ?  
Biopsy: Nonossifying fibroma



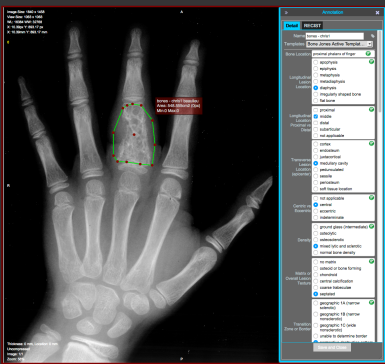
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## Bones Jones Legacy Collection - Digitized



1,664 radiographic cases (22,864 images) digitized at 600 dpi resolution

## Bones Jones Legacy Collection - Annotated



Diagnosis	# Samples
osteosarcoma	63
enchondroma	65
metastasis	55
osteochondroma	46
chondrosarcoma	41
giant cell tumor	41
aneurysmal bone cyst	41
Ewing sarcoma	38
nonossifying fibroma	38
fibrous dysplasia	30
lymphoma	22
chondroblastoma	21
eosinophilic granuloma	19
simple bone cyst	19
osteoid osteoma	16
non-Hodgkin lymphoma	16
malignant fibrous histiocytoma	14
osteomyelitis	11
chondromyxoid fibroma	11
osteoblastoma	10
periosteal chondroma	10
multiple myeloma	10
ganglion cyst	9
Paget disease	9
giant cell reparative granuloma	8
intramedullary lipoma	7
adamantinoma	7
hemangioma	7
plasmacytoma	6

For 811 cases including 66 unique diagnoses, a key image from each case was annotated for 18 clinical and qualitative features using the AIM standard within iPad

## Bones Jones Legacy Collection - Annotated

- Evaluated 3 overlapping subsets:
  - (Rare) Minimum 5 examples of each diagnosis:
    - 710 cases, 29 unique diagnoses
  - (Intermediate) Minimum 18 examples of each diagnosis:
    - 559 cases, 14 unique diagnoses
  - (Common) Minimum 30 examples of each diagnosis:
    - 478 cases, 10 unique diagnoses



Henry H. Jones, M.D. 1917-2012

## Bones Jones Legacy Collection - Retrieval

- Naïve Bayes classifier (Bao Do, MD) generated probabilities for all diagnoses
- Diagnoses are ranked by probability
- Validation:
  - Each subset evaluated using leave-1-out cross validation
  - Primary accuracy** - whether or not the algorithm predicted the correct pathological diagnosis as the top ranked machine output
  - Differential accuracy** - whether or not the algorithm returned the correct pathological diagnosis within the top three machine predictions

Subset	Minimum # Diagnosis Cut- Off	Total Cases	Distinct Diagnosis	Naïve Bayes Diff Accuracy	Naïve Bayes Primary Accuracy
Rare	5	710	29	60%	44%
Intermed	18	559	14	73%	56%
Common	30	478	10	80%	62%

## PACS of the Future - Semantic Retrieval



Based on your description, here are similar diagnoses in other male patients this age

## PACS of the Future - Pixel Based Retrieval



Based on the selected pixels, here are similar diagnoses in other male patients this age

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Thank You!